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THE SUCCESS OF GOVERNMENT-COMMUNITY GROUP PARTNERSHIPS IN ORCHID CONSERVATION IN VICTORIA, AUSTRALIA

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ABSTRACT. In Victoria, 59 nationally threatened orchid species have draft or completed recovery plans. The Victorian Department of Sustainability and Environment (DSE) has the primary responsibility of implementing these recovery plans. DSE has a limited capacity to complete all identified actions and objectives of the recovery plans. A large resource of non-government personnel, made up of Australian Native Orchid Society members, field naturalists, and the general community, is available to assist with a range of conservation actions. Members of these groups possess a range of skills and experience, share a passion for orchid conservation, and provide continuity of involvement. To encourage the formation of partnerships, DSE has established the "Botanic Guardians" scheme, which funds community groups that undertake small projects to help conserve threatened native plants, including orchids in Victoria. This paper highlights numerous successful actions undertaken by government and community groups in partnership. These include broad-scale surveying and annual counts of larger populations; site management such as caging plants, hand pollination, in-situ management and seed collection/dispersal; group searches of potential habitat to discover new populations; and ex-situ cultivation.

Key words: orchid, community, government, partnerships, conservation, Victoria

INTRODUCTION

The state of Victoria has 59 threatened orchid species with recovery plans (Commonwealth of Australia 2004), and a total of 170 orchids listed as threatened at the state level (Department of Sustainability and Environment 2003). The Department of Sustainability and Environment (DSE) has a limited capacity to complete all the required actions and objectives of the recovery plans for all threatened species; and therefore, the long-term success of orchid conservation relies heavily on partnerships between government and community groups. Volunteers are essential to these partnerships and consist of Australian Native Orchid Society (ANOS Victoria) group members, Victorian Field Naturalists Club (VFNC) members, and the general community.

Without community involvement, the chances of arresting the decline in orchid biodiversity are slim (Safstrom & O'Byrne 2001). Volunteers are a valuable and essential element in orchid conservation. They share a passion for threatened species conservation. They bring with them a broad range of skills (e.g., plant identification, cultivation skills, surveying). In addition, they offer project stability and long-term ownership, local knowledge and history, and in many instances, the advantage of living in close proximity to a threatened orchid population. Volunteers also play a valuable 'grassroots' role in community extension, and they have credibility within the community.

DSE offers volunteers direction, leadership, knowledge, information, technical support, technology (mapping, GPS, computers), grants to encourage the formation of partnerships, and access to state, national, and international networks.

Successful recovery actions being undertaken by government-community partnerships include broad-scale surveying and annual counts of larg-

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er populations to acquire baseline population data; fine-scale site management such as caging plants; in-situ management including hand pollination and seed collection/dispersal; group searches of potential habitat to discover new populations; ex-situ cultivation; reintroduction of cultivated plants to existing or new sites; education, extension, and research.

PARTNERSHIPS

Two broad categories of partnerships occur in Victorian orchid conservation: action-based partnerships consisting of community groups that obtain grants from DSE, and a technical advice group consisting of professionals, research students, and expert amateurs.

In 1992, DSE with financial support from the Commonwealth Government through the Natural Heritage Trust (NHT) established the 'Botanic Guardians' scheme to help conserve Victoria's rare and threatened native plant species on public land. Botanic Guardian grants encourage and support community groups to carry out local conservation projects with grants obtainable to a maximum of $3000. The allocated Commonwealth resource for Botanic Guardians is $30,000 per calendar year. The reporting requirements of a grant consist of a brief report at completion of the project, a statement of expenditure, and photos of activities completed. To date, 11 community Botanic Guardians orchid projects have been completed successfully. The information gathered from these projects is entered into DSE databases and contributes to management programs.

To oversee the orchid recovery program in Victoria, the Threatened Orchid Recovery Team (TORT) was established in 1999. Its members are drawn from Australian Native Orchid Society (ANOS) Victoria, Field Naturalist Club members, universities, Royal Botanic Gardens Melbourne (RBG), Parks Victoria, and the Royal Melbourne Zoo. TORT is responsible for monitoring and reviewing the orchid recovery program in Victoria. The team also provides scientific and technical advice regarding aspects of recovery plan actions (Coates 2002). Major actions are summarized here.

Identify Critical Habitat/New Populations

A key element of recovery efforts is identifying and mapping critical habitats for threatened species. ANOS (Victoria) has conducted successful targeted searches for nationally endangered orchids. For example, in 2001, *Pterostylis despectans* (Nicholls) M.A. Clem & D.L. Jones was known from five populations with less than 1500 plants in Victoria and ca. 600 plants in three populations in South Australia. The Victorian populations are threatened by site disturbance (gold mining/fossicking, recreational vehicles, timber/firewood collecting), grazing by kangaroos, wallabies, rabbits/hares, and white-winged choughs—raven-sized birds that excavate the orchids and eat the tubers (Falkingham 1995). Illicit collection by unscrupulous growers also poses a threat to orchid populations (Coates et al. 2002).

ANOS (Victoria) volunteers searched the DSE Flora Information System (FIS) database to generate a list of potential habitat sites with >70% species overlap with known *Pterostylis despectans* sites. Using this information, ANOS (Victoria) was able to target searching and, in 2001 and 2002, new populations were discovered. As a result, the known Victorian population has nearly doubled (3148 plants), and the westerly range of *P. despectans* has been extended by 15 km. This work has been supported by DSE Botanic Guardians funding for the past 3 years.

Acquiring Baseline Data

Permanent monitoring plots (PMP) have been established progressively for many species of threatened orchids in Victoria. Data has been collected for some populations of orchids since 1996. Population data (leaf, flowering, and seed stages) are collected either annually or several times a year by volunteers and DSE Flora and Fauna staff. Attributes monitored include plant status (vegetative, dug/eaten, wilted), rosette size and number of leaves, bud number and viability, flower number and viability, presence of natural pollination, seed pod production, and association with moss (FIGURE 1). Volunteers are instructed in the collection of monitoring data in a scientific manner and, together with DSE staff, interpret this data and incorporate findings into conservation activities. Over time, results from these studies may allow predictions of population growth rates.

In-Situ Management

Community groups play a large role in the amelioration of threats to Victorian orchids. These threats include habitat destruction via land clearance, weed invasion, herbivore predation (both native and introduced herbivores), inappropriate fire regimes, site disturbance, altered hydrology, small population size, absence of natural pollinators, and illicit collection (Backhouse & Jeanes 1995). In-situ management involves the following methods.

Flora Monitoring Data Sheet

Species:	*Pterostylis basaltica*
Population No:	4156A
Observer:	Andrew Pritchard, ANOS
Location:	Woorndoo - Dundonnell Road
	South side of road
Quadrat:	A
Distance between Pegs (m):	5000.

V - vegetative
B - bud formed
F - flowering
S - seed pod developed
R - seed released from ripe pod
U - unobserved
E - part of plant eaten
D - dug up
W - nominate part of plant wilted
J - juvenile

20/07/2001

Plant No.	A1 Peg (m)	A2 Peg (m)	X Co-ordinate	Y Co-ordinate	No. rosette plants	No. flowering plants	Rosette size mm	Stem size cm	
1	1080	4130	580	911	2		45		
2	1060	4280	717	781	1		45		
3	1090	4260	736	804	1		50		
4	1240	4120	789	956	2		40		
5	1110	4810	1066	310	3		28		
6	1250	4750	1184	400	1		30		
7	1320	4790	1264	380	1		49		
8	1740	5090	1727	212	1		10		
9	2150	5390	2149	57	2		35		
10	2690	5460	2679	242	2		42		
11	2690	5470	2680	232	1				J 2 leaf
12	2720	5410	2702	313	1		42		

FIGURE 1. Example of a flora-monitoring data sheet for permanent monitoring plots, Victoria, Australia.

Caging and Fencing of Plants

The caging of individual plants to protect them from native and introduced herbivore grazing by kangaroos, wallabies, rabbits, white-winged choughs, and emus has been a valuable activity undertaken by many volunteers. For example, in 2002 and 2003, ANOS (Victoria) members caged 142 *Pterostylis despectans* rosettes primarily to protect them from white-winged choughs, and rabbits, thus assisting flower production and seedpod formation. The use of kangaroo, wallaby, and rabbit exclusion plots has proven effective, and many wild populations of orchids have been fenced to prevent grazing.

In 1992, a naturalist found a single *Caladenia rosella* G.W. Carr in the Christmas Hills region of Victoria and a second plant the following year. The plants were subject to a number of threats, including grazing by rabbits, wallabies, and white-winged choughs; a lack of food plants for its natural pollinator; and destruction/loss of its required microhabitat (small moss beds). In 1995 a rabbit-proof fence was constructed at the site, and volunteers have led a program of hand pollination, individual caging, site weeding, and microhabitat creation and restoration. This program has been a great success, with 35 known plants currently at the site. The fencing and caging of plants not only reduced grazing of *C. rosella* plants but also of many understory plants that are food sources for the orchid's natural pollinator (Duncan 2000).

The long-term exclusion of grazing, however, may not be suitable in all orchid colonies. Vegetation disturbance is required to maintain many habitats, e.g., grazing or burning to sustain the vegetation structure of grasslands.

Hand Pollination, Seed Collection, and Dispersal

Seed collection is a critical component of the DSE in-situ and ex-situ conservation program in

Victoria. Where population size is determined to be critically low, hand pollination and collection of seed capsules are carried out in partnership with community groups. This requires around-the-clock monitoring at critical times of the year. Given that departmental field staff cover large geographic areas, the presence of community volunteers living near a threatened orchid location is a vital resource.

The large geographic range and extended flowering time of numerous orchid species that are the focus of conservation activities have motivated community groups, individuals, and DSE staff to develop ingenious methods of seed capsule collection. One technique trialed successfully is the 'tea bag method' recommended by ANOS (Victoria). This involves encapsulation of individual pollinated flowers with an empty teabag to reduce the threat of the seed dehiscing prior to collection.

Mycorrhizal Slide Baiting

Slide baiting is undertaken depending on the availability and quantity of seed produced from the previous year. Following the method developed by Rasmussen and Whigham (1993), 'miracloth' is inserted into an unused plastic slide mount that has a hinged flap to form an envelope. A small amount of orchid seed harvested the previous season is placed in the miracloth envelope. Installation of the baits occurs after summer, generally prior to or just after the onset of autumn rains. Baits are installed along transects, horizontally in the soil for *Caladenia* species, generally at the depth that the mycorrhizal fungi is active in the soil.

This season, DSE and the community will install more than 2000 mycorrhizal slide baits for 15 species at 30 sites. After the slide baits are lifted in late spring, they are inspected under a microscope for protocorm development. The presence of mycorrhizal fungus highlights areas where manually dispersed seed is most likely to successfully produce seedlings. This technique is allowing DSE to create new or extend existing populations of threatened orchids. Fungal baiting in previous years has been successful in capturing mycorrhizal fungus away from parent plants.

Microhabitat Management

Microhabitat management involves volunteers and DSE staff in conducting a number of management activities over a range of sites. Activities include scattering leaf litter around areas that are devoid of vegetative litter, as in the *Caladenia audasii* R.S. Rogers site in central Victoria (Todd 2000); trimming vegetation to encourage flower production for *C. hastata* (Nicholls) Rupp; and weed eradication.

ANOS (Victoria) group members have been successful in their repeated efforts to control the weed *Watsonia meriana* (L.) Mill. var. *bulbullifera* (J.W. Mathews & L. Bolus) D.A. Cooke along a rail reserve to help conserve a population of *Diuris punctata* Sm. Herbicide is applied to individual leaves of the watsonias via shoe polish bottles to eliminate the potential risk of herbicide drift. In areas away from *D. punctata* plants, the *Watsonia* bulbs are hand-pulled.

Volunteers and DSE use fire as a management tool for *Prasophyllum suaveolens* D.L. Jones & R.J. Bates at Dowling Cemetery. In conjunction with the local Country Fire Authority (volunteer fire fighters), several control burns have been undertaken to reduce weed competition and increase orchid numbers. Spot burning of individual woody weeds is also undertaken on this site.

Ex-Situ Cultivation

Volunteers provide their time and expertise to assist state government agencies in the implementation of conservation strategies. Translocation of in-situ material from a population is sometimes undertaken in a strategic long-term planning situation or in emergencies such as 'orchid rescues' from development sites.

Examples of strategic ex-situ cultivation occurred with *Diuris fragrantissima* D.L. Jones et M.A. Clem. *Diuris fragrantissima* currently has only three plants remaining in the wild population (Backhouse et al. 2000). Fortunately five ex-situ populations total 200 plants. This ongoing project has been in operation for several years in association with the Royal Melbourne Zoological Gardens (Melbourne Zoo), DSE, the Victorian University of Technology, the Society for Growing Australian Plants (Basalt Plains Group), ANOS (Victoria), the Royal Botanic Gardens in Melbourne, the National Botanic Gardens in Canberra, and local field naturalists. In conjunction with the Zoo, ANOS (Victoria) members with excellent cultivation skills have been growing *D. fragrantissima* in multiple shade houses to remove the possibility of having the entire ex-situ collection destroyed by a single catastrophic event (e.g., virus infection). The long-term goal is to translocate plants and seed to increase the size and number of wild populations.

Volunteers assist with 'orchid rescues' from development sites. For example, orchid tubers of several species, including the state threatened *Pterostylis maxima* M.A. Clem. & D.L. Jones were removed from a subdivision site in the goldfields area of Victoria. These orchids were

placed in pots and maintained by ANOS (Victoria) members. A plan for strategic translocation of these plants into secure public and private land is being developed by DSE in conjunction with ANOS (Victoria) members and local field naturalists.

Reintroduction

The initial process undertaken by DSE for a reintroduction of a threatened orchid species involves the installation of slide baits along a transect to establish the presence/absence of mycorrhizal fungus. If the fungus is present, as identified by a protocorm development, seed is then sown in the following year at the intersection point of that transect. In addition to this, plants that have been propagated ex-situ are installed along the transect, where fungus has not been observed. Translocated plants are grown at the RBG in its extensive ex-situ propagation facility. Seedpods are harvested and stored from the previous year, and mycorrhizal fungus is isolated from mature material (collars). Plants are kept in cultivation until their second growth season and then translocated into the field.

In addition to material being translocated, DSE currently is trialing transplantation for *Caladenia hastata* by transferring seedlings in-situ to intersection points along a transect. Historically, *C. hastata* was confined to a small area of southwest Victoria (Duncan et al. 2004). From the 1980s until 1995, only two populations of *C. hastata* were known. Much of the site of one population was destroyed by the construction of an aluminium smelter (Backhouse & Jeanes 1995). Plants that occurred at the site were rescued and either placed in ex-situ cultivation or translocated to a secure site.

Since 1997, extensive in-situ conservation management actions have been initiated for this species (Duncan et al. 2004). The Point Danger Committee of Management and ANOS (Victoria) undertake a range of recovery actions, such as hand pollination, seed collection, and cultivation and plant searches in habitat that has been ecologically burnt. At the end of the 1997 season, the two known sites had only ten plants between them and, although monitored annually, had not increased naturally in population size. During 1998 monitoring, seedlings were observed around a plant where seed had been distributed the previous year. These plants had developed in an area that was high in organic material. This observation has led to development and implementation of extensive in-situ conservation protocols for this species at this site. Protocols include intensive slide baiting, vegetation trimming, hand pollination, seed capsule collection, seed dispersal around parent plants, translocation of seedlings, and digital multi-spectral videography of habitat.

An objective of the recovery plan for *Caladenia hastata* is establishment of five populations of 300 adult plants per population, 1500 plants in total (Todd 2000). Currently, 720 individuals are growing in five populations, the Point Danger population being the most secure in terms of plant numbers with a total of 700 plants. The recovery of this species would not be possible without the participation of the ANOS (Victoria) members in conjunction with the Natural Heritage Trust, industry partners (Alcoa), RBG, Parks Victoria, and DSE.

Current and future in-situ research, with community group participation, includes installation of mycorrhizal fungi grown on sterilized millet at the RBG. This procedure will allow DSE to create new populations of threatened orchids at sites that either previously contained populations or have been determined suitable for reintroduction sites. Volunteers assist with determining the suitability of a potential reintroduction site by undertaking mycorrhizal baiting and vegetation mapping. The reintroduction research demonstrates how volunteers groups can assist in the ex-situ conservation of threatened orchid species.

Education and Extension

A critical role taken by volunteers is their ability to maintain an effective network of major stakeholders. Volunteers have credibility within their community. An example is the recovery effort for *Prasophyllum suaveolens* (Coates et al. 2002) in the Dowling Cemetery, where ANOS (Victoria) volunteers provide consistency of project involvement and effective networking with the local cemetery trust, local council, and DSE—all of whom are stakeholders in management of the site (Dilley 2002). ANOS (Victoria) volunteers are tackling weeds and monitoring the orchids on an annual basis. The advantage of local volunteers is their ability to assist in supervision of contractors associated with the Cemetery Trust.

Community volunteers are invited to attend and participate in threatened orchid workshops and, on occasion, have been financially supported by DSE to attend research seminars. This information is then disseminated throughout newsletters and meetings of their organizations.

Research

Victoria has a number of students undertaking postgraduate research on threatened orchids.

Their research includes identifying mycorrhizal associations within orchid species and also in-situ orchid conservation, in which they are investigating enhancement of orchid populations by actions developed by volunteers and DSE staff. A number of educational institutions are linked with the research committee of TORT.

Past research has been instrumental in developing linkages between the theory of cultivating ex-situ orchid plants and the practice of community and DSE personnel implementing in-situ conservation management practices. Experimentation with the sowing of seed, mycorrhizal establishment, transplantation of container-grown orchid plants, and plant translocation are ongoing.

Conclusions

The role of volunteer involvement in successful orchid recovery programs cannot be underestimated. The Department of Sustainability and Environment recognizes that for successful orchid conservation to continue, partnerships with community volunteers need to be maintained. Structures are in place for continuous volunteer development (e.g., permanent monitoring plots, workshop attendances) and on-ground guidance (e.g., by the DSE state-wide network of threatened orchid officers) to guarantee that volunteer efforts are well directed and coordinated across the state. The significant contribution by community groups to orchid conservation is widely acknowledged within DSE, and funding continues to be provided to community groups for orchid conservation projects. DSE envisions building on the success of these established partnerships to foster even greater community involvement and achievements in Victorian orchid conservation.

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